STATE OF IDAHO
DEPARTMENT OF PUBLIC LANDS
Forest Pest Report No. 2
March 1973

BIOLOGICAL EVALUATION OF EXISTING DOUGLAS-FIR TUSSOCK MOTH POPULATIONS IN NORTHERN IDAHO TO DETERMINE DAMAGE POTENTIAL FOR 1973

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INTRODUCTION

The Douglas-fir tussock moth, Hemerocampa pseudotsugata McDunnough, is an important defoliator of true firs, Abbies spp. L., and Douglas-fir Pseudotsuga menziesii var. glauca (Beissner) Franco over much of western North America. In Idaho the preferred hosts are Douglas-fir, grand fir, subalpine fir, and white fir, all being equally acceptable.

Damage to the trees is caused by the newly hatched larvae feeding on the new foliage, causing it to shrivel and turn brown. By mid-July the larger larvae feed on both new and old foliage, first stripping the tops of the trees and outermost portions of the branches, then feeding into the inner crown (Mason and Baxter, 1970; Wickman, et al., 1971). Tunnock (1964) reports that while most trees are only top killed, occasionally they may be completely defoliated and killed in one season. Wickman (1963) reported that trees weakened through defoliation suffered pronounced growth loss, and many were subsequently attacked by bark beetles.

Severe tussock moth outbreaks have occurred in most of the western states (Tunnock, 1964). In Idaho the first recorded infestation occurred from 1927-1930 on the Idaho and Weiser National Forests destroying 40 square miles of Douglas-fir (Evenden, 1946). Subsequent infestations have appeared in the following years (Tunnock, 1963, 1964; Scribner, 1965):

Location and Area Affected	Damage First Recorded	Outbreak Subsided	Duration of Noticeable Infestation	Years from Previous Outbreak
1. Sawtooth Nat'l Forest; spot infestations	1935	1939	4 yr.	5
2. Northern Idaho, NE Oregon, E.Washington; 500,000 acres	1944	1947	3	5
3. Owyhee County, Idaho; 10,000 acres	1951	1952	2	4
4. Owyhee County, Idaho; 26,000 acres	1957	?	?	5
5. Moscow to St. Maries, Ida.; 205,000 acres	1962	1965	3	4

During annual insect detection surveys conducted in 1970 and 1972, personnel of the U. S. Forest Service, Division of State & Private Forestry, once again detected tussock moth larvae in northern Idaho and neighboring states (Tunnock, 1972).

Population levels of the Douglas-fir tussock moth appear to be cyclic in nature with outbreaks occurring every 4 to 6 years (Tunnock, 1964). Populations build up inconspicuously over a period of years causing little observable damage until a defoliation threshold is reached. Beyond this point they may suddenly cause unexpected extensive damage. When an outbreak does occur it may cause heavy defoliation from 1 to 3 years, after which the population usually declines very abruptly due to natural causes, falling to a near zero density level (Mason and Thompson, 1971). Some outbreaks, however, have persisted at low levels for as long as 8 years (Wickman, et al., 1971). In nature the main cause of the sharp decline in the tussock moth populations is apparently due to an epizootic of a necleopolyhedrosis virus (Hughes and Addison, 1970; Mason and Thompson, 1971).

The two Douglas-fir tussock moth control projects that have been conducted in Idaho (Evenden and Jost, 1947; Scribner, 1965) were effected when the moth populations were apparently at or very near the peak of the population curve. Thus it appears that while the extensive chemical control projects may have prevented some tree mortality or growth loss, it is very likely that they would not have been necessary to bring about a decline of the population. In both control projects (1947 and 1965) the populations crashed in unsprayed as well as in sprayed areas. The main causal agent being the polyhedrosis virus (Evenden and Jost, 1947; Tunnock, 1966). The same phenomena has been observed with other Douglas-fir tussock moth outbreaks, the majority of which have not been treated with chemicals. The populations have run their cycle of a build up to epidemic levels, then have suddenly decreased very rapidly to very low levels apparently through the action of the virus (Mason and Thompson, 1971). Unfortunately, outbreaks seldom end before they cause considerable tree damage (Wickman, 1963; Wickman and Scharpf, 1972).

In order to avoid this damage we need to re-orient our control measures. Previous

control projects and those presently under consideration in Oregon and Washington have been directed at the insect after the majority of the damage has been done. If effective control efforts could be applied during the buildup phases of the population it would appear that extensive damage could be avoided.

Results from annual insect detection surveys conducted by the Division of State & Private Forestry, USFS, indicate that in North Idaho we are in or approaching the build-up phase of the Douglas-fir tussock moth population cycle (Tunnock, 1972).

In order to correlate future control efforts and begin preparing a time schedule for possible salvage operations, the exact level of the population needs to be determined. With this in mind this survey was initiated.

The current Douglas-fir tussock moth egg populations were evaluated in order to determine the potential for causing conspicuous tree defoliation in the spring and summer of 1973. Also, egg masses were collected to determine the level of nucleopolyhedrosis virus in the tussock moth population. The field work was conducted in general areas of North Idaho having a history of being epidemic centers in previous Douglas-fir tussock moth outbreaks. The work was conducted during February 1973 by cooperating crews from the U. S. Forest Service, Division of State & Private Forestry, and the Idaho Department of Public Lands.

METHODS

The egg mass evaluation was based on Mason's (1969) standardized sequential sampling method for detecting and evaluating rising tussock moth populations. Plots were located within the chosen areas and eight potential host trees were sampled. The sample consisted of four limbs cut from the tree and examed for the presence of egg masses and pupal cases. Measurements were also taken of the foliage area to standardize the results on the basis of the number of egg masses per 1,000 square inches of foliage.

RESULTS

Figure 1. summarizes the results of this evaluation. Twenty-eight (28) plots were

examined for evidence of Douglas-fir tussock moth activity in Benewah and Latah Counties, Idaho. Current years (1972) cocoons or egg masses were found in sample trees of eleven plots. Mason's (1969) sequential sampling method showed heavy (extensive defoliation expected) populations in four plots and intermediate (lighter defoliation) in three plots. Only cocoons were found in the remaining four plots. Numerous egg masses were seen in three other areas not sampled by Mason's technique. Only one old egg mass (1971 or older) was found in all plots.

Current egg masses have also been found near Post Falls, on ornamental trees in Coeur d'Alene and Moscow and on ornamental trees near Troy, Idaho. These infestations will probably persist in 1973 and may spread to adjacent forested areas.

The virus incidence evaluation has not been completed and data is not available at this time.

DISCUSSION

Various degrees of defoliation are predicted for four general areas shown in Figure 1. Extensive defoliation is expected along the Palouse Range with the heaviest damage being expected around the Twin Peaks area and extending north. Some defoliation will probably occur south and southeast of Mica Mountain. Heavier defoliation is expected from Mineral Mountain along the Skyline Drive to McCroskey State Park. The largest area of defoliation will probably extend along the divide from Windfall Pass, south, to the North-South Ski Area. Numerous egg masses indicate that the Charles Butte and Moses Mountain vicinities will probably have the heaviest defoliation within this area.

Epidemic Douglas-fir tussock moth infestations have occurred in Benewah and Latah Counties in 1946 and 1964. These infestations were first noticed in several of the same areas sampled in this survey. Mason's (1969) sequential sampling procedure and the presence of only one 1971 or older egg mass indicates that this population is increasing. If Douglas-fir tussock moth larvae are blown from the ridge tops into presently uninfested areas, or if the infestation is larger than this survey indicates, a severe epidemic may be developing for the summer of 1973 or 1974.

Case histories of tussock moth infestations in California, Oregon, and Idaho indicate that outbreaks normally follow a 3-year cycle (Wickman, et al., 1973; Tunnock, 1963, 1964). Inconspicuous to minimal defoliation occurs the first year, severe damage the second year, continued defoliation and ultimate collapse of the population by the end of the third year. If the current infestation follows this pattern the summer of 1973 may be the period when extensive damage occurs.

Finding the current Douglas-fir tussock moth population in what appears to be the release phase of an epidemic offers a unique opportunity for control and research. Control efforts initiated at this stage could possibly prevent the extensive damage normally associated with epidemics. Since there are no compounds presently registered for use on the tussock moth, the opportunity exists for testing of potential materials and making observations on the population dynamics of a potential epidemic.

Current plans are to follow the population with evaluations of the larval populations during the spring of 1973, and continued sampling of egg masses in the fall of 1973. Tentative plans should be made for control if severe damage is eminent.

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